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(54) Recording, reproduction and editing of data.

(57) Audio signals are recorded on recording tracks of a disc shaped recording medium (1) in a predetermined schedule for making establishment of an associated track information table easier and allowing after-recording of audio signals with respect to each video signal. In addition, selective or entire erasure of video signals and associated audio signals is automatically performed when one of the recording tracks recording one of the video signals or the associated audio signals is ordered to be erased.

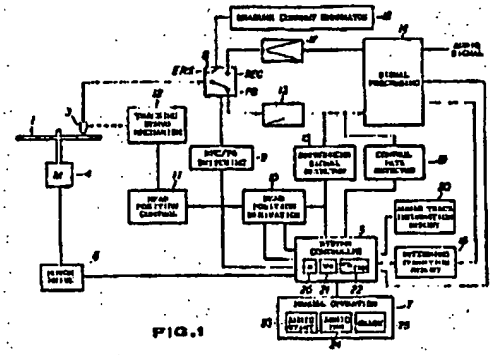

FIG.1

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Description

RECORDING, REPRODUCTION AND EDITING OF DATA

This invention relates to apparatus for and methods of recording and/or reproducing data, for example recording and/or reproducing both video and audio signals on the same recording medium. More particularly, but not exclusively, the invention relates to a so-called "after-recording" recording technique that can be used, for instance, for recording audio signals on a recording medium after video signals have been recorded. The invention also relates to editing of recorded information, including erasure of recorded information.

European Patent Application Publication No. EP-A-0 180 477 discloses a signal recording or reproducing apparatus for recording a video signal indicative of a still image and an audio signal. The video and audio signals are recorded on a magnetic disc having a plurality of recording tracks. Each of the recording tracks records one field of video signal or 10 seconds of audio signal. The video signal and the audio signal can be recorded on the magnetic disc recording medium in various modes. For instance, the video signal and the audio signal can be recorded on the magnetic disc independently of each other in an independent recording mode and the audio signal can be associated with the video signal to be reproduced synchronously with reproduction of the associated video signal in an associating recording mode. In the latter mode, the audio signal to be associated with the still image can include an identification code of one of the tracks which stores the associated video signal.

European Patent Application Publication No. EP-A-0 223 423 discloses an audio signal reproducing technique for use in an electronic still image recording or reproducing apparatus which records a video signal indicative of a still image and an audio signal in a manner similar to that disclosed in EP-A-0 180 477. EP-A-0 223 423 discloses a technique for recording audio signals to be associated with one still image on a plurality of recording tracks.

In that apparatus, information regarding the order of reproduction of the audio signals on different recording tracks becomes necessary for reproducing the audio signals in a desired order. Therefore, an information signal is generated which includes information regarding a leading track number, the immediately following track number and the track number of one of the recording tracks storing the associated video signal. A table memory can be provided for storing information corresponding to that recorded with the audio signal and establishing a table showing the relationship between the information stored in the respective tracks on the magnetic disc. The table memory can allow smooth selection of the associated tracks and thus allow smooth reproduction of the video sign[illegible] and associated audio signals.

In such a video and audio signal recording or reproducing apparatus, it would be desirable to provide the capability of editing the recorded information.

First to fourth aspects of the invention are defined by claims 1, 11, 16 and 26, respectively.

According to a fifth aspect thereof, the invention provides a recording and/or reproducing apparatus which is provided with an after-recording capability. In an after-recording operation, audio signals are recorded on recording tracks according to a predetermined schedule for making the establishment of an associated track information table easier and allowing after recording of audio signals with respect to each video signal. The recording or reproducing apparatus may perform automatic erasure, either selectively or entirely, of the video signal and the associated audio signals, when one of the recording tracks recording one of the video signals and the associated audio signals is required to be erased.

According to a sixth aspect of the invention, there is provided a recording and reproducing apparatus for use with a recording medium having a plurality of mutually separated data recording regions, each being identified by a unique identification number and having a capacity of recording one field of video data or a given period of audio data, the apparatus comprising first means for recording video data on a selected one of the data recording regions which is identified by a first identification number, and second means, which is triggered in an after-recording mode, for recording the audio data with a second identification number and an identification of at least one data recording region to constitute a group to be reproduced in synchronism with each other.

According to a seventh aspect of the invention, there is provided a recording apparatus (or a recording and reproducing apparatus) in combination with a recording medium having a plurality of mutually separated data recording regions which each store one field of video data in a first data recording region and audio data in at least one second data recording region, each of the first and second data recording regions being identified by unique identification numbers and associated with each other to be reproduced synchronously, the apparatus comprising first means for selecting one of the first and second data recording regions to erase the data stored therein, second means for finding all of the first and second data recording regions storing video or audio data associated with the data stored in the selected data recording medium, and third means for performing erasure for the first and second data recording regions selected by the first means and the second means.

In a preferred construction, the recording medium records a plurality of items of video data and audio data constituting a plurality of groups, each including video data or audio data stored in the first and the second data recording regions, and the audio data includes identification data of each group. The second means detects the identification data, selects all of the second data recording regions containing the same group identification data, and sets a marking indicative of erasure demand. The third means erases the data on the

first and second data recording regions having the erasure demand indicative marking on the second data recording regions and the first data recording region associated with the second data recording regions to be erased.

A preferred embodiment of the invention described below provides: an apparatus and method for editing including after-recording and erasure of audio signals in association with video signals; an after-recording apparatus and technique for recording audio signals after recording video signals, which after recording apparatus and technique allow effective recording of audio signals in association with video signals; and an editing apparatus and technique for effectively erasing unnecessary video and audio signals during an editing operation.

The invention will now be further described, by way of illustrative and non-limiting example, with reference to the accompanying drawings, in which:

Figure 1 is a block diagram of an editing apparatus according to a preferred embodiment of the invention;

Figure 2 shows a magnetic disc to be used in recording video and audio signals, and which is applicable to the apparatus of Figure 1;

Figure 3 shows the data format stored in an audio track together with an audio signal;

Figure 4 is a flowchart of an after-recording control program performed by the apparatus of Figure 1;

Figures 5A, 5B and 6A, 6B, 6C, and 6D are examples of audio signal recording patterns in an after-recording mode of operation;

Figure 7 is a flowchart of an erasure control program performed by the apparatus of Figure 1;

Figure 8 shows an example of groups of video and audio signals to be erased by execution of the erasure control program of Figure 7; and

Figure 9 shows an example of the order of the audio tracks in the audio track groups.

Referring now to the drawings, particularly to Figures 1 and 2, an editing apparatus according to a preferred embodiment of the invention is designed for reproducing video signals and recording and reproducing audio signals. The video and audio signals are recorded on a recording medium in the form of a magnetic disc 1. The magnetic disc 1 is formed with a plurality of recording tracks 2_1, 2_2, 2_3, 2_4 ... 2_{49}, 2_{50}, as shown in Figure 2. In the illustrated embodiment there are fifty such recording tracks. Tracks on which audio information is recorded are subsequently referred to as audio tracks A and tracks on which video information is recorded are subsequently referred to as video tracks V. In the preferred editing apparatus, as shown in Figure 1, the magnetic disc 1 is chucked on a turntable (not shown) of a disc driving mechanism in opposition to a magnetic head 3 which is designed for recording and reproducing video and audio signals. The disc drive mechanism includes a disc drive motor 4 which rotates the disc 1 with the turntable. The motor 4 is connected to a motor drive control circuit 6 which is, in turn, connected to a system controller 5. The system controller 5 includes a microprocessor (not shown) which controls the system according to programs contained within a memory (not shown) thereof.

The system controller 5 is connected to a manually operable unit 7 for selecting the mode of operation of the editing apparatus. The system controller 5 is also connected to a manually operated switching circuit 9 to allow the operator to selectively control the switch position of a mode selector switch 8 between a recording mode (hereinafter "REC mode") position, a playback or reproduction mode (hereinafter "PB mode") position and an erase mode position. The switching circuit 9 receives a mode control signal from the system controller 5 to move the mode selector switch 8 to a REC mode position, a PB mode position or an erase mode position.

The system controller 5 is also connected to a head position derivation circuit 10. The circuit 10 is connected to a head position control circuit 11 which controls the operation of a tracking servomechanism 12. The servomechanism 12 initially places the magnetic head 3 at a position opposite to an outermost track 2_1 and drives the head radially with respect to the disc 1 at a controlled magnitude as controlled by a tracking servo control signal from the head position control circuit 11. The system controller 5 outputs a tracking control signal, indicative of the recording track on or from which the video or audio signal is to be recorded or reproduced, to the head position derivation circuit 10. The circuit 10 receives the tracking control signal and derives the magnitude of the radial shift of the magnetic head 3 which is necessary to move it from the outermost track position to the selected track position. The head position derivation circuit 10 thus feeds a tracking magnitude indicative signal to the head position control circuit 11 which produces the tracking servo control signal.

The magnetic head 3 is electrically connected to the mode selector switch 8. The switch 8 has a playback terminal (hereinafter "PB terminal") which is connected to an input of an audio signal processing circuit 14 via a playback amplifier 13. The switch 8 also has a recording terminal (hereinafter "REC terminal") which is connected to an output of the audio signal processing circuit 14 via a recording amplifier 17. The audio signal processing circuit 14 is connected to an external audio signal source to receive therefrom an audio signal.

The playback amplifier 13 is also connected to a reproduced signal detector circuit 15. The circuit 15 detects the envelope of a reproduced radio frequency (RF) signal to produce an envelope indicative signal which is inputted to the system controller 5. The envelope indicative signal is also fed to the head position derivation circuit 10. The envelope indicative signal as inputted to the head position derivation circuit 10 serves as a feedback signal for deriving the magnitude of the radial shift of the magnetic head 3.

In the illustrated embodiment, the tracking operation is performed in 10 steps per one track. The head position is precisely derived by the head position derivation circuit 10 by detecting the peak of the envelope

indicative signal from the reproduced signal detecting circuit 15. The head position derivation circuit 10 outputs the head position data to the system controller 5 indicating precise position of the magnetic head 3. The system controller 5 detects the track number data corresponding to where the magnetic head is placed and information reproduced from the corresponding track. Based on the detected information, the system controller 5 outputs recording condition indicative data to a recording memory 16. The memory 16 further records data of the video signals recorded in a field mode or a frame mode, the data, and so forth. In addition, the illustrated embodiment is also provided with an erasure current source or generator 18. The source 18 is connected to the magnetic head 3 via an erase mode (hereinafter "ERS mode") terminal of the mode selector switch 8. Therefore, the ERS mode is selected by the switch 8 as controlled by the switching circuit 9.

The playback amplifier 13 is further connected to an input of an audio track control data detector circuit 19 which detects control data which includes various information in a data format illustrated in Figure 3. As shown in Figure 3, the control data includes a synchronisation signal SYNC, a track number Nt, audio distinction data AT, and video distinction data VT. In the preferred embodiment, audio signals recorded on a plurality of tracks constitute a group to be consecutively reproduced as an audio signal sequence. Furthermore, a sole audio track or group of audio tracks can be coupled with one of the video tracks so as to be reproduced in synchronism with reproduction of the video signal stored in the associated video track. Therefore, the control code illustrated in Figure 3 further includes identification data of the first track of grouped audio tracks Nf (hereinafter "first track data"), of the next audio track Nn (hereinafter "following track data") and of the associated video track Nc (hereinafter "video track data").

The audio track control data detector circuit 19 feeds the detected controlled data through the system controller 5 to an audio track information memory 20. The memory 20 stores the first track data Nf, the following track data Nn and the video track data Nc in the form shown in the following table:

Track Number	Video Track	First Track	Following Track
Nt	Nc	Nf	Nn
A11	V1	A11	A12
A12	V1	A11	A13
A13	V1	A11	A13
A21	V2	A21	A22
A22	V2	A21	A23
A23	V2	A21	A23
A31	--	A31	A32
A32	--	A31	A33
A33	--	A31	A33

The operation of the preferred editing apparatus will now be described with reference to Figures 4 to 9.

First, an after-recording process performed by the editing apparatus will be described with reference to Figures 4 to 6. Before starting after-recording, the editing apparatus is operated in a reproduction mode. Therefore, the system controller 5 outputs the mode selector signal to the switching circuit 9 to cause switching of the mode selector switch 8 to select the PB mode position. The system controller 5 also outputs a disc drive control signal to the motor drive circuit 6 to drive the disc drive motor 4. The system controller 5 also successively outputs the head position control signal to the head position derivation circuit 10. The circuit 10 is responsive to the head position control signal and the envelope indicative signal from the reproduced signal detecting circuit 15 to derive the magnitude of the radial shift of the magnetic head 3 to output a tracking magnitude indicative signal to the head position control circuit 11. The head position control circuit 11 outputs in response thereto a tracking servo control signal to operate the tracking servomechanism 12. Therefore, the magnetic head 3 is driven radially across the recording tracks 2_1, 2_2 ... 2_{49}, 2_{50}. During this radial scan, the magnetic head 3 is driven in the reproduction mode to reproduce signals stored in the respective recording tracks. Therefore, signals stored in all of the recording tracks 2_1, 2_2 ... 2_{49}, 2_{50} are reproduced in order. The reproduced signal detecting circuit 15 thus detects an envelope of the reproduced RF signal and inputs the

envelope indicative signal to the system controller 5. The system controller 5 then establishes a recording condition indicative table showing the already recorded tracks and empty tracks and other associated data. The recording condition indicative table is then stored in the recording condition memory 16.

As will be seen from Figures 5A and 5B, in one example, video signals are stored on the magnetic disc 1 with a spacing of a given number of track intervals. Namely, in the illustrated example (see Figure 5A), a video track V2 is formed by recording a video signal while leaving three empty tracks E (A1, A2 and A3) between a video track V1 and the video track V2, and a video track V3 is formed while leaving two empty tracks E (A4 and A5) between the video tracks V2 and V3. Following the video track V3, three empty tracks E (A6, A7 and A8) are left. The empty tracks E (A1, A2 ... A8) serve as audio tracks for recording audio signals during an after-recording process described below, the video tracks being associated with groups of audio tracks as shown (by way of example) by arrows in Figure 5B.

After establishing the recording condition table in the recording condition memory 16, one of the video tracks V1, V2, V3 ... Vn is selected, by means of the manually operable unit 7, for performing after-recording to record the audio signal. In response to this manual selection of the video track, the system controller 5 selects one of the empty tracks to be the first track of a group of audio tracks. In the illustrated embodiment, since the magnetic head 3 scans from the outermost track 2_1 to the innermost track 2_{50}, the track which is to be the first audio track in the group of audio tracks to be associated with the selected video track has to be the immediately adjacent inner track with respect to the selected video track.

Under this condition, the system controller 5 outputs the mode selector signal to the switching circuit 9 to cause switching of the mode selector switch 8 to select the REC mode position.

At this point, an after-recording control program shown in flow chart form in Figure 4 is executed by the system controller 5. Beginning at a step 100, the position of an audio start switch 23 in the manually operable unit 7 is checked. After starting execution of the after recording control program, the editing apparatus is held in a stand-by state until turning ON of the audio start switch 23 is detected at the step 100.

When turning ON of the audio start switch 23 is detected, a check is performed as to whether the selected video track number Vn can be rewritten or not, at a step 102, by checking the condition of a rewrite inhibiting flat FL_{INH} in a write inhibit flag register 22 in the system controller 5. If rewriting the selected video track number is not inhibited, as checked at the step 102, the selected video track number Vn corresponding to the video track selected through the manually operable unit 7 is written in a temporary register 21 in the system controller 5, at a step 104. Then, the rewrite inhibiting flag FL_{INH} is set at a step 106.

At a step 108, the track number Vn stored in the temporary register 21 is read. Based on the read track number, the track number to start audio recording is identified. In practice, since the audio recording is to be performed for the empty track or tracks oriented on the inner side of the selected video track Vn, audio recording begins with the first track of the audio track group so that the track number of the audio recording start track is determined by adding one to the track number Vn of the selected video track. After setting the track number at the step 108, a check is performed, at a step 110, as to whether the track of the new set number is a video track. If the track checked at the step 110 is not a video track, a further check, as to whether the set track is empty, is performed at a step 112. When the set track is empty, as checked at the step 112, the system controller 5 outputs the head position control signal, to the head position derivation circuit 10, at a step 114. The head position derivation circuit 10 detects the instantaneous head position based on the input from the reproduced signal detector circuit 15 and derives the direction and magnitude for shifting the magnetic head 3 to produce a corresponding tracking magnitude indicative signal. The head position control circuit 11 is responsive to this tracking magnitude indicative signal to drive the tracking servomechanism 12 to cause a radial shift in the direction and magnitude as indicated by the tracking magnitude indicative signal. After tracking is completed, the magnetic head 3 is held in a stand-by state.

Then, a check is performed as to whether or not an audio end switch 24 is operated, at a step 116, and as to whether the elapsed time exceeds a preset period of time, at a step 118. The preset period of time is set for defining the maximum length of the audio signal to be recorded on one track. In order to expand the capacity for audio recording on one track, the audio signal is recorded on the track in time-base compressed form. Therefore, the signal processing circuit 14 performs time-base compression of the audio signal. As a result, the illustrated embodiment allows recording of 10 seconds of audio signal. In practice, the signal processing circuit 14 adds control data to be recorded with the audio signal on the audio track. The control data to be added has the format shown in Figure 3.

After expiration of the preset period of time, the system controller 5 outputs a recording control signal to make the signal processing circuit 14 output the audio signal with the control data to the magnetic head 3 via the recording amplifier 17 and the mode selector switch 8, at a step 120. After completing audio recording for the selected audio track, the write inhibit flag FL_{INH} in the write inhibit flag register 22 is reset at a step 122.

After the step 122, the process returns to the step 108 for performing audio recording on the next empty track. Therefore, the set number of the track is again incremented by one at the step 108. Then, the newly set track is checked at the step 110 to determine whether it is a video track. When the newly set track is not a video track, a check is performed at the step 112 as to whether the set track is empty or not. When the checked track is empty, the process proceeds to perform the steps 114 to 112 for recording the audio signal with the control data.

When the track checked at the step 110 is a video track, the process returns to the step 102. When the write inhibit flag FL_{INH} is set, so that updating of the content of the temporary register 21 is inhibited as checked at

the step 102, the process jumps to the step 108 to increment the track number by one.

Otherwise,the track number of the video track as detected at the step 110 is written in the temporary register 21, in place of the former track number, at the step 104. Then, the process proceeds through the steps 106 to 122 for recording audio signals on audio tracks to be associated with the subject video track.

In some cases, the audio signal can be recorded before after-recording is performed. For this track, over-writing of the audio signal should not be performed. Therefore, when the track as checked at the step 112 is not empty, the process returns to the step 108 to shift to the next track in the inward direction.

When the audio end switch 24 is turned ON before the duration of the audio signal reaches the preset time, a shorter length of the audio signal can be recorded on the track by jumping the process from the step 116 to the step 120.

As will be appreciated, in the illustrated process for after-recording, since the tracks for performing audio recording are left blank before after-recording, the after-recording operation and detection of the recording state of each track becomes simplified.

Although the above-described embodiment is designed for leaving empty tracks between video tracks for making the after-recording operation easier, it is instead possible to record the video signals in consecutive tracks and leave audio recording areas, constituted by a plurality of consecutive empty tracks, for after-recording of the audio signals, as shown in Figures 6A to 6D.

The illustrated editing apparatus can perform a group erasure operation for erasing all of the grouped audio tracks and the associated video track by identifying one of the tracks in the grouped audio signal or associated video signal. In order to enable the group erasure operation, the system controller 5, at first, performs scanning of all of the recording tracks 2_1, 2_2, ... 2_{49}, 2_{50} for establishing the recording condition indicative table in the recording condition memory 16 and the audio track information table in the audio track information memory 20. After establishing the recording condition indicative table and the audio track information table, one of the tracks Vn upon which the erasure operation is to be performed is manually selected by the manually operable unit 7. Then, the system controller 5 operates the head position derivation circuit 10, the head position control circuit 11 and the tracking servomechanism 12 for setting the magnetic head 3 at the selected track.

The process of erasing recorded data is controlled by the system controller 5 operating under an erasure control program shown in flow chart form in Figure 7. Beginning at a step 200, the position of an erasure switch 25 is checked. When turning ON of the erasure switch 25 is detected at the step 200, the system controller 5 outputs the mode selector control signal ordering the PB mode. In response to the PB mode control signal, the switching circuit 9 switches the mode selector switch 8 to the PB mode position to reproduce the signal stored on the tracks. The reproduced signal is checked by the control data (code) detector circuit 19. The control data detected by the control data detector circuit 19 is checked at a step 202. When control data is not detected with respect to the signal reproduced from the selected track, it is determined that the selected track is a "ghost" track which stores some signal but a distinction between a video track and an audio track cannot be made. When the selected track is not a ghost track, as checked at the step 202, a check is performed at a step 204 as to whether the selected track is a video track. When the selected track is a video track, as checked at the step 204, or a ghost track, as checked at the step 202, an erase mark is set at a step 206 on the track number data in the recording condition table of the recording condition memory 16. Thereafter, the selected track number Vn is set in the temporary register 21, as a group identification track number, at a step 208.

When the selected track is not a video track, as checked at the step 204, a check is performed at a step 210 as to whether the selected track is an audio track. If the selected track is not an audio track, as checked at the step 210, which means that the selected track is an empty track, the process goes directly to END. When the selected track as checked at the step 210 is an audio track, an erase mark is set on the track number in the recording condition indicative table of the recording condition memory 16, at a step 212. Thereafter, the audio track information data in the audio track information table in the audio track information memory 20 is checked at a step 214 to determine whether the audio track group including the selected track is associated with the video track. When an associated video track number Nc is detected, as checked at the step 214, the associated video track number Nc is set in the temporary register 21 as a group identification track number Vn, at a step 216.

After setting the group identification track number at the step 208 or at the step 216, a counter value N of a track number counter 26 in the system controller 5, which counter value represents the current track number, is incremented by one at a step 218. This number represents the next track in the radially inward direction on the recording medium (disc) 1. Then, the new counter value (N = N+1) is compared with the maximum track number value, in this example 50, at a step 220. When the track number counter value N is not greater than the maximum track number, a check is performed at a step 222 as to whether the corresponding track, as represented by the track number counter value N, is an audio track. If so, the audio track information data of the corresponding audio track is checked in the audio track information table at a step 224. At the step 224, the associated video track number Nc as derived from the audio track information table is compared with the video track number Vn stored in the temporary register 21. If the associated video track number Nc matches the video track number Vn set in the temporary register 21 as checked at the step 224, an erase mark is set on the track number of the recording condition table of the recording condition memory 16 at a step 226.

If the track identified by the track number counter value N is not an audio track, as checked at the step 222, or if the associated video track number does not match video track number set in the temporary register 21, as

checked at the step 224, the process returns to the step 218.

By repeating the process through the steps 218 to 226, erase marks can be set for all of the audio tracks subsequent to the track selected by the manually operable unit 7 which are also associated with the same video track. Note that all tracks having a higher number than the track selected by the manually operable unit 7 will be checked to determine if they have the same associated video track number, in which case they will be marked for erasure. Thus, even audio tracks which are not arranged consecutively with the selected track will be marked for erasure. For example, with the recording pattern shown in Figure 6C, if the video track V2 is selected for erasure, the associated audio tracks A21 and A22 will also be marked for erasure. Likewise, if the audio track A21 is selected, the track A22 (but not the video track V2) will also be automatically marked for erasure.

Referring again to the step 214, when no associated video track is found by checking the audio track information table against the selected track, the first track data Nf is read from the audio track information table at a step 228. The read first track number Nf is then set in the temporary register 21 as Vn at the step 228.

After setting the first audio track number at the step 228, a counter value N of a track number counter 26 in the system controller 5, which counter value represents the current track number, is incremented by one at a step 230. Then, the track number counter value N is compared with the maximum track number value, e.g. 50, at a step 232. When the track number counter value N is not greater than the maximum track number, a check is performed at a step 234 as to whether the corresponding track as represented by the track number counter value N is an audio track. If so, the audio track information data of the corresponding audio track is checked in the audio track information table at a step 236. At the step 236, the associated first audio track number is compared with the audio track number Vn stored in the temporary register 21. If the two numbers match, an erase mark is set on the track number of the recording condition table of the recording condition memory 16 at a step 238.

If the track identified by the track number counter value N is not an audio track, as checked at the step 234, or if the corresponding first audio track number as read from the audio track information table does not match the audio track number set in the temporary register, as checked at the step 236, the process returns to the step 230.

By repeating the process through the steps 230 to 238, erase marks can be set for all of the audio tracks associated with the first audio track set in the temporary register which are subsequent to the track selected by the manually operable unit 7.

When the track number counter value N becomes greater than the maximum track number as checked at the step 220 or at the step 232, the system controller 5 produces, at a step 240, a mode selector control signal which is supplied to the switching circuit 9 to cause switching of the mode selector switch 8 to the ERS mode position. At this position, the erasure current from the erasure current souce 18 is supplied to the magnetic head 3 through the mode selector switch 8. The system controller 5 also outputs the head position control signal to move the magnetic head 3 to the tracks for which the erase marks have been set in the recording condition table of the recording condition memory 16. Therefore, all of the video and audio tracks grouped to be reproduced synchronously can be erased. The process of selecting a video track and a related group of audio tracks for erasure together is depicted schematically in Figure 8.

Figure 9 shows two groups of audio tracks. The order of the tracks as illustrated in Figure 9 represents the physical location of the tracks on the magnetic disc 1 and the track numbers represent the order in which recorded data is to be reproduced. Even with this irregular order of the tracks, group erasure of the tracks can be performed as explained above.

While the invention has been disclosed in terms of a preferred embodiment in order to facilitate a better understanding of the invention, it should be appreciated that the invention can be embodied in various other ways. For example, though the foregoing discussion has concentrated on the group erasure mode in erasing the recorded signals, it is possible to erase signals in each track independently of the other. Furthermore, if desired, only the group of audio signals associated with the video signal can be erased while maintaining the video signal.

Claims

1. A recording apparatus for use with a recording medium (1) having a plurality of mutually separated data recording regions (2_1-2_{60}) each being identified by a different identification number and having a capacity for recording a field of video data or a given period of audio data supplied from an external source, the apparatus comprising:

first means for recording the video data on a selected one of said data recording regions (2_1-2_{60}) which is identified by a first identification number; and

second means for thereafter recording on another of said data recording regions (2_1-2_{60}) the audio data along with a second identification number and a group identification number of at least one data recording region to designate a group of data recording regions whose recorded data are to be reproduced in synchronism with each other.

2. Apparatus according to claim 1, wherein said first means is operative to record a plurality of items of video data (V_1-V_3) on a plurality of mutually different data recording regions spaced apart by at least one data recording region (E) that is left blank, and said second means is operative to record said audio data (A_1 to A_8) in said at least one blank data recording region (E) between the data recording regions storing video data.

3. Apparatus according to claim 2, which comprises third means for setting the number of consecutive data recording regions to be left blank after a data recording region storing said video data.

4. Apparatus according to claim 1, wherein said second means records audio data over a plurality of consecutive data recording regions along with a different identification number and the same group identification number in each of the consecutive data recording regions.

5. Apparatus according to claim 4, wherein said second means is operative to limit the number of data recording regions for storing audio data to be reproduced consecutively.

6. Apparatus according to any one of the preceding claims, capable of use with a recording medium (1) which is in the shape of a disc having plurality of concentrically arranged tracks serving as said data recording regions (2_1-2_{50}).

7. Apparatus according to claim 6, wherein each track has a capacity of one field of video data representative of a still image.

8. Apparatus according to claim 6 or claim 7, wherein the identification numbers correspond to the track numbers.

9. Apparatus according to any one of the preceding claims, wherein the group identification number is the first identification number.

10. Apparatus according to claim 3, wherein the group identification number is the identification number of the first of the data recording regions in which audio data is recorded.

11. An editing apparatus for use with a recording medium (1) having a plurality of mutually separated data recording regions (2_1-2_{50}) each being identified by a different identification number and each data recording region having recorded therein a different identification number, a group identification number for designating a group of data recording regions whose recorded data are to be reproduced synchronously, and a field of video data or a given period of audio data, the editing apparatus comprising:

first means for selecting one of the data recording regions (2_1-2_{50}) to erase the data stored therein;

second means for locating the data recording regions in which are recorded video or audio data associated with the data recorded in said selected data recording region by reproducing the identification numbers and the group identification numbers of selected ones of the data recording regions and comparing the group identification numbers with the group identification number of the selected one data recording region; and

third means for erasing the data from the data recording regions selected by said first means and said second means.

12. Apparatus according to claim 11, wherein: said second means includes means for detecting which of said data recording regions (2_1-2_{50}) in which audio data is recorded have the same group identification number as the selected one data recording region, and memory means (16), connected to the detecting means, for storing a marking indicative of an erasure demand for each such detected data recording region; and said third means is operative automatically to erase data in said data recording regions for which an erasure demand indicative marking is stored in the memory means whereby the selected one data recording region and the data recording regions grouped to be reproduced synchronously with it are erased.

13. Apparatus according to claim 12, capable of use with a recording medium (1) which is disc shaped and has a plurality of concentrically arranged tracks (2_1-2_{50}) serving as said data recording regions, each having a capacity for recording one field of video data representative of a still image, the identification numbers corresponding to the numbers of the tracks.

14. Apparatus according to claim 13, wherein the group identification number corresponds to the track number of a track on which video data is recorded.

15. Apparatus according to claim 12, for use with a recording medium which has audio data recorded over a plurality of consecutive data recording regions along with a different identification number and the same group identification number in each of the consecutive data recording regions, wherein the detecting means is operative to scan the data recording regions in a radial direction beginning with the selected one of the data recording regions.

16. A recording method for use with a recording medium having a plurality of mutually separated data recording regions (2_1-2_{50}) each being identified by a different identification number and having a capacity for recording a field of video data or a given period of audio data supplied from an external source, the method comprising:

recording the video data on a selected one of said data recording regions (2_1-2_{50}) which is identified by a first identification number; and

thereafter recording on another of said data recording regions the audio data along with a second identification number and a group identification number of at least one data recording region to designate a group of data recording regions whose recorded data are to be reproduced in synchronism with each other.

17. A method according to claim 16, wherein said step of video data recording comprises recording a plurality of items of video data (V_1-V_3) on a plurality of mutually different data recording regions spaced apart by at least one data recording region (E) that is left blank, and said step of audio data recording comprises recording said audio data in said at least one blank data recording region between data recording regions storing video data.

18. A method according to claim 17, which comprises setting the number of consecutive data recording regions to be left blank after a data recording region storing said video data.

19. A method according to claim 16, wherein said step of audio data recording comprises recording audio data over a plurality of consecutive data recording regions along with a different identification number and the same group identification number in each of the consecutive data recording regions.

20. A method according to claim 19, wherein said step of audio data recording comprises limiting the number of data recording regions for storing audio date to be reproduced consecutively.

21. A method according to any one of claims 16 to 20, wherein said recording medium (1) is in the shape of a disc having a plurality of concentrically arranged tracks serving as said data recording regions (2_1-2_{50}).

22. A method according to claim 21, wherein each track has a capacity of one field of video data representative of a still image.

23. A method according to claim 21 or claim 22, wherein the identification numbers correspond to the track numbers.

24. A method according to any one of claims 16 to 23, wherein the group identification number is the first identification number.

25. A method according to claim 18, wherein the group identification number is the identification number of the first of the data recording regions in which audio data is recorded.

26. A method of editing a recording medium (1) having a plurality of mutually separated data recording regions (2_1-2_{50}) each being identified by a different identification number and each data recording region having recorded therein a different identification number, a group identification number for designating a group of data recording regions whose recorded data are to be reproduced synchronously, and a field of video data or a given period of audio data, the editing method comprising:

selecting one of the data recording regions to erase the data stored therein;

locating the data recording regions in which are recorded video or audio data associated with the data recorded in said selected data recording region by reproducing the identification numbers and the group identification numbers of selected ones of the data recording regions and comparing the group identification numbers with the group identification number of the selected one data recording region; and

erasing the data from the data recording regions selected by said track selecting step and said locating step.

27. A method according to claim 26, wherein: the locating step includes detecting which of said data recording regions in which audio data is recorded have the same group identification number as the selected one data recording region and storing a marking indicative of an erasure demand for each such detected data recording region; and the erasing step includes automatically erasing data on said data recording regions for which an erasure demand indicative marking is stored whereby the selected one data recording region and the data recording regions grouped to be reproduced synchronously with it are erased.

28. A method according to claim 27, wherein said recording medium (1) is disc shaped and has a plurality of concentrically arranged tracks (2_1-2_{50}) serving as said data recording regions, each having a capacity for recording one field of video data representative of a still image, and wherein the identification numbers correspond to the numbers of the tracks.

29. A method according to claim 28, wherein the group identification number corresponds to the track number of a track on which video data is recorded.

30. A method according to claim 27, wherein the recording medium has audio data recorded over a plurality of consecutive data recording regions along with a different identification number and the same group identification number in each of the consecutive data recording regions, and wherein the detecting step includes scanning the data recording regions in a radial direction beginning with the selected one of the data recording regions.

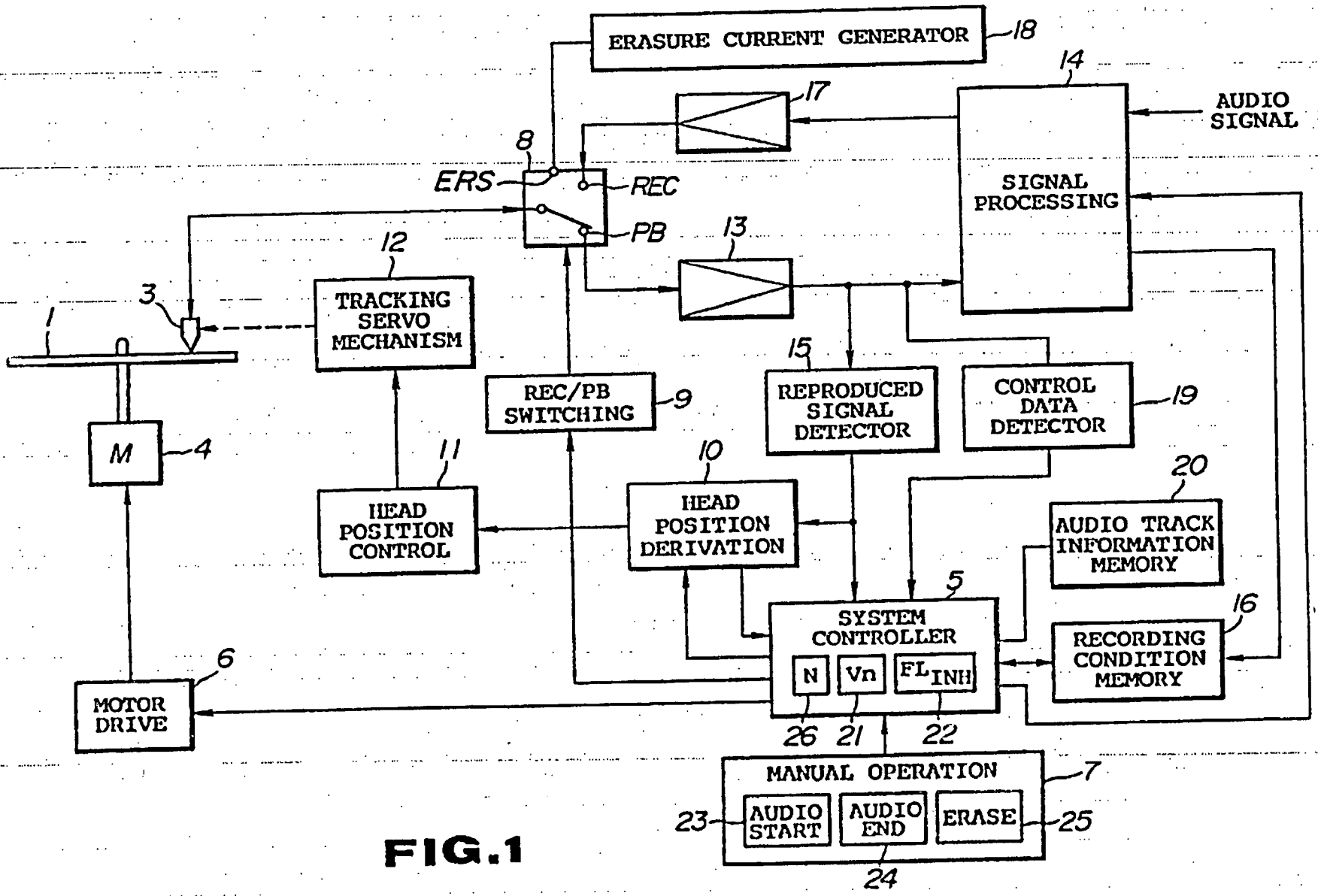

FIG.1

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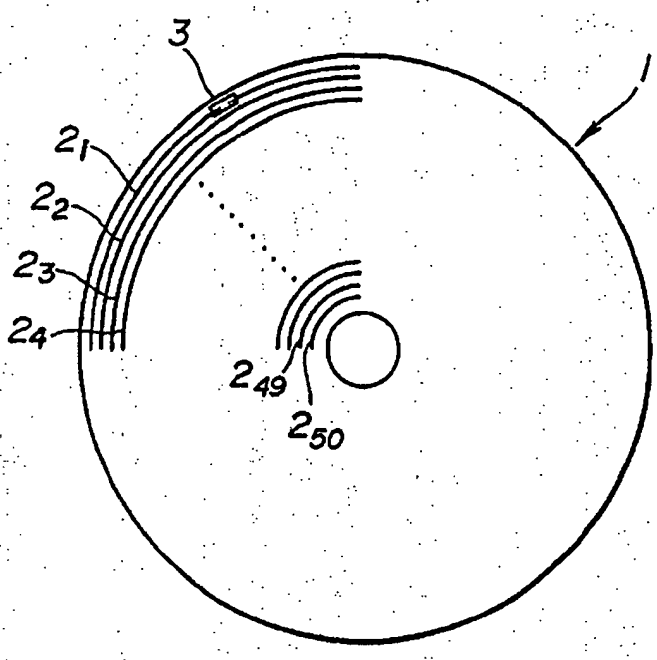

FIG.2

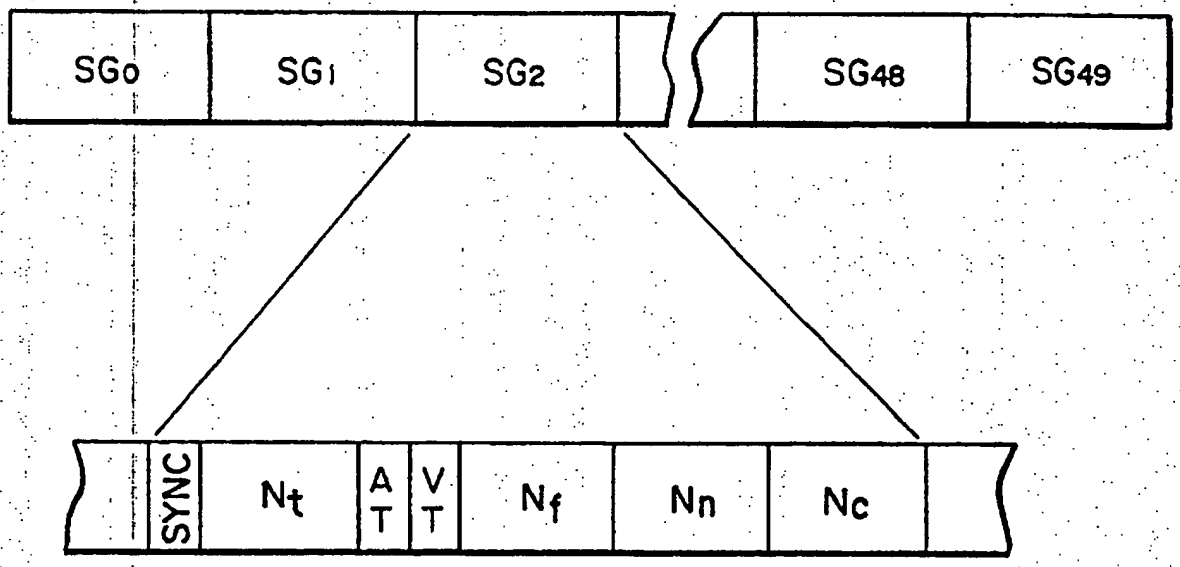

FIG.3

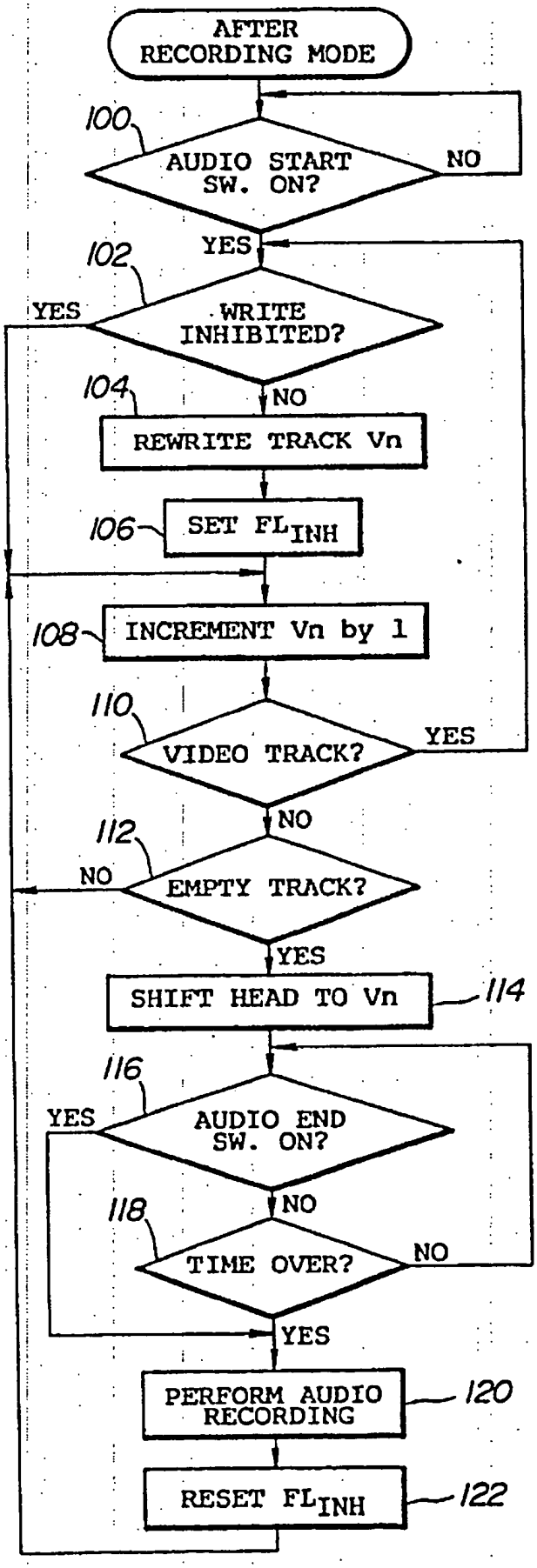
AFTER RECORDING MODE
100
AUDIO START SW. ON?
NO
YES
102
WRITE INHIBITED?
YES
NO
104
REWRITE TRACK Vn
106
SET FL INH
108
INCREMENT Vn by 1
110
VIDEO TRACK?
YES
NO
112
EMPTY TRACK?
NO
YES
SHIFT HEAD TO Vn
114
116
AUDIO END SW. ON?
YES
NO
118
TIME OVER?
NO
YES
PERFORM AUDIO RECORDING
120
RESET FL INH
122

FIG. 4

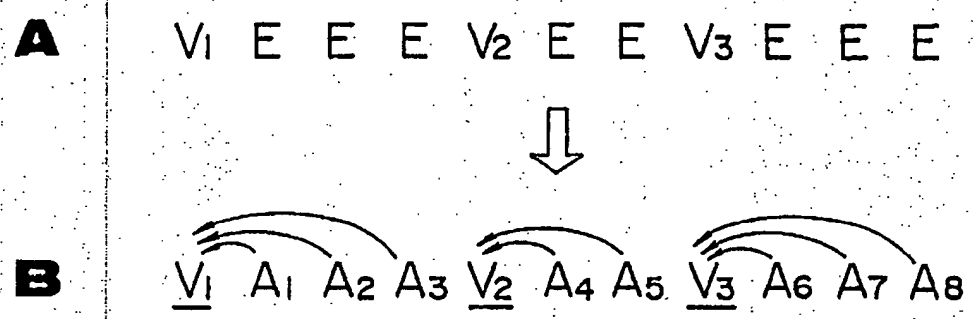
A
V1 E E E V2 E E V3 E E E
B
V1 A1 A2 A3 V2 A4 A5 V3 A6 A7 A8

FIG.5

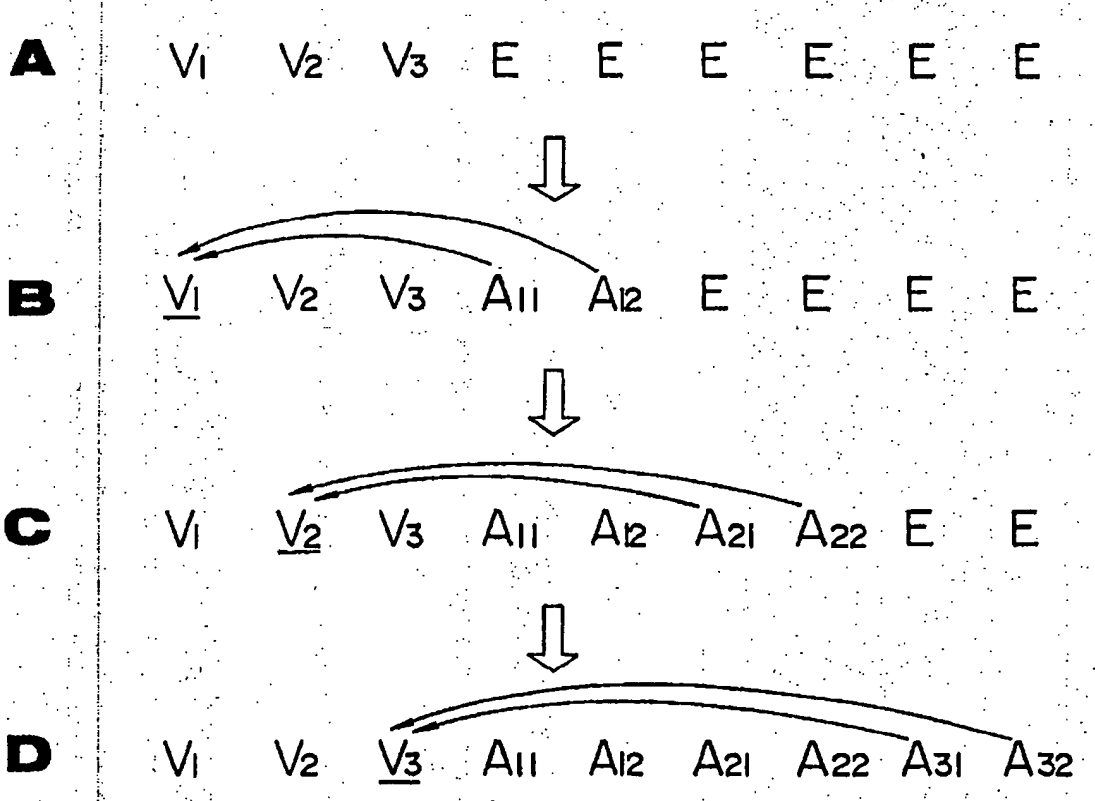
A
V1 V2 V3 E E E E E E
B
V1 V2 V3 A11 A12 E E E E
C
V1 V2 V3 A11 A12 A21 A22 E E
D
V1 V2 V3 A11 A12 A21 A22 A31 A32

FIG.6

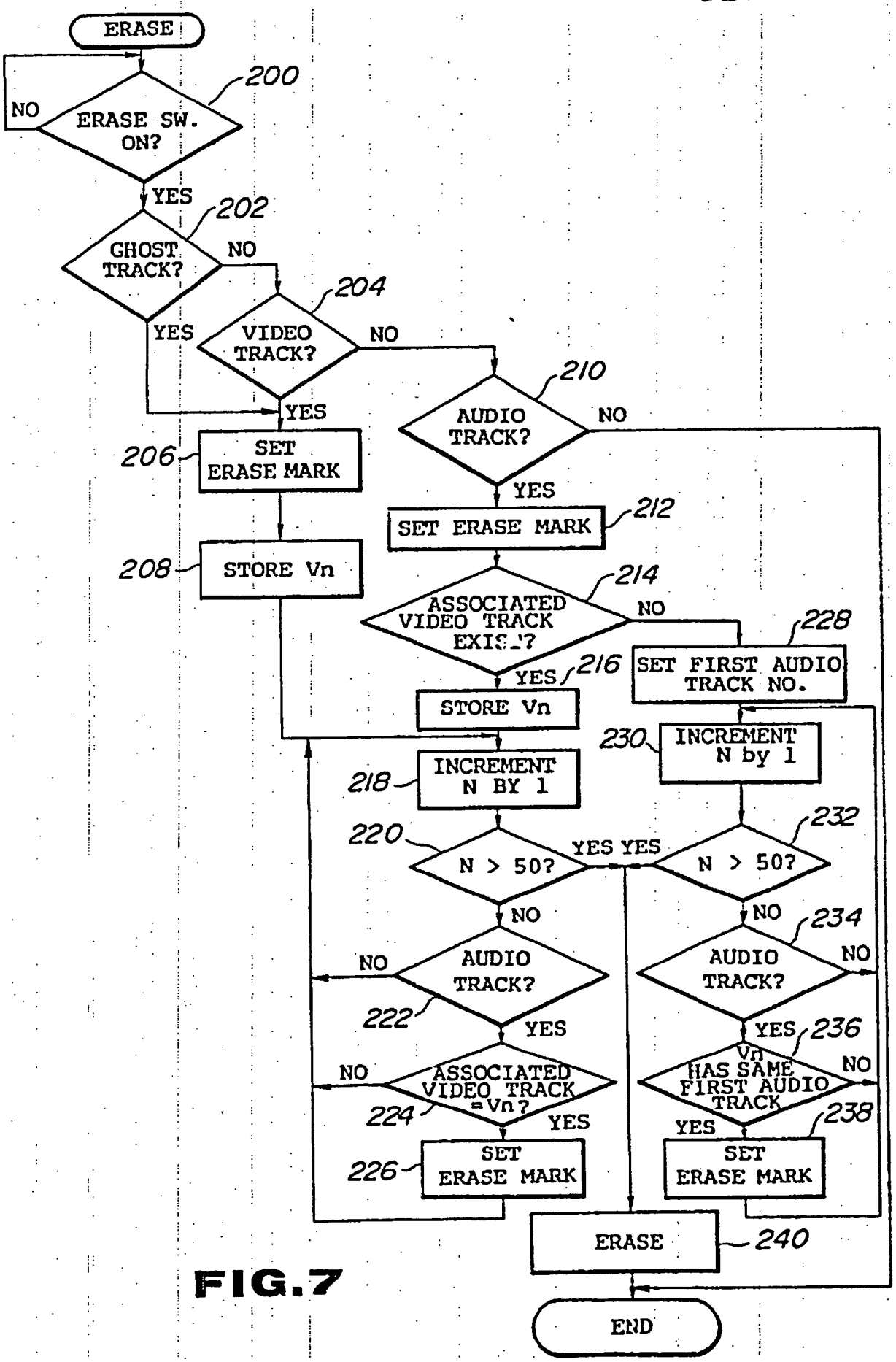
ERASE
200
ERASE SW. ON?
NO
YES
202
GHOST TRACK?
NO
YES
204
VIDEO TRACK?
NO
YES
206
SET ERASE MARK
208
STORE Vn
210
AUDIO TRACK?
NO
YES
212
SET ERASE MARK
214
ASSOCIATED VIDEO TRACK EXIS_?
NO
YES
216
STORE Vn
228
SET FIRST AUDIO TRACK NO.
230
INCREMENT N by 1
218
INCREMENT N BY 1
220
N > 50?
YES
NO
232
N > 50?
YES
NO
222
AUDIO TRACK?
NO
YES
224
ASSOCIATED VIDEO TRACK =Vn?
NO
YES
226
SET ERASE MARK
234
AUDIO TRACK?
NO
YES
236
Vn HAS SAME FIRST AUDIO TRACK
NO
YES
238
SET ERASE MARK
ERASE
240
END

FIG.7

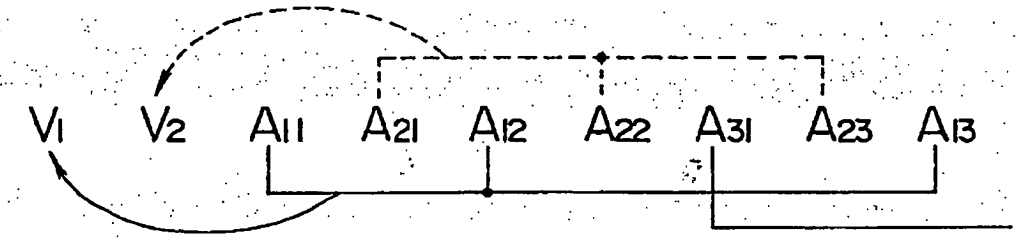

FIG. 8

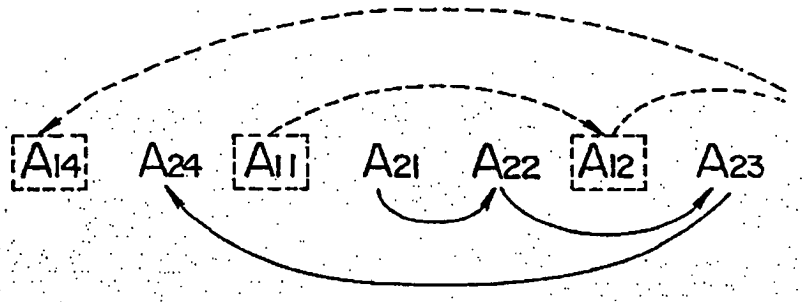

FIG. 9

0295148

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 88305381.1

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl 4)
Y,D	EP - A1 - 0 223 423 (SONY) * Claims; fig. 1,8 * --	1-30	H 04 N 5/78 G 11 B 27/02
Y	US - A - 4 480 273 (FUJIKI) * Abstract; column 6, lines 6-10; column 2, lines 8-37; fig. 5 * --	1-30	
A	US - A - 4 602 296 (MURAKOSHI) * Abstract; column 2, lines 15-31 * --	1,6-8, 16,21-23	
A	EP - A1 - 0 057 086 (SONY) * Abstract; fig. 2 * --	1,11, 16,26	
A	DE - A1 - 3 515 251 (GRUNDIG) * Abstract * ----	1,2	TECHNICAL FIELDS SEARCHED (Int. Cl.4) H 04 N 5/00 G 11 B 27/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	08-09-1988	DIMITROW

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding

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